

FIG. 1

Fig. 2.

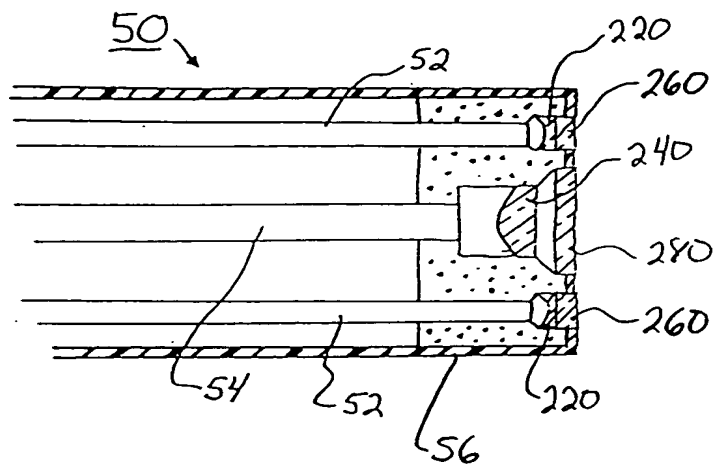


Fig. 3

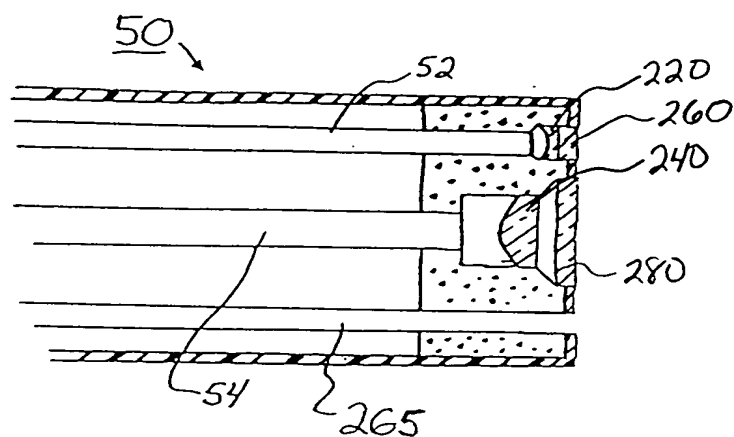


Fig 4

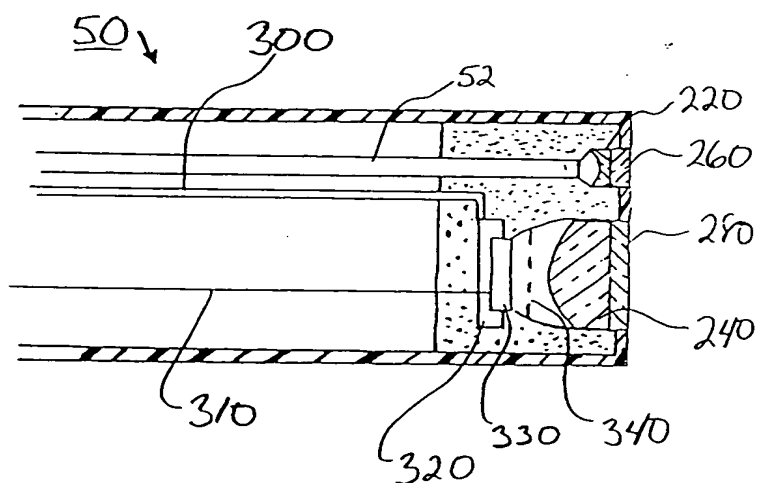
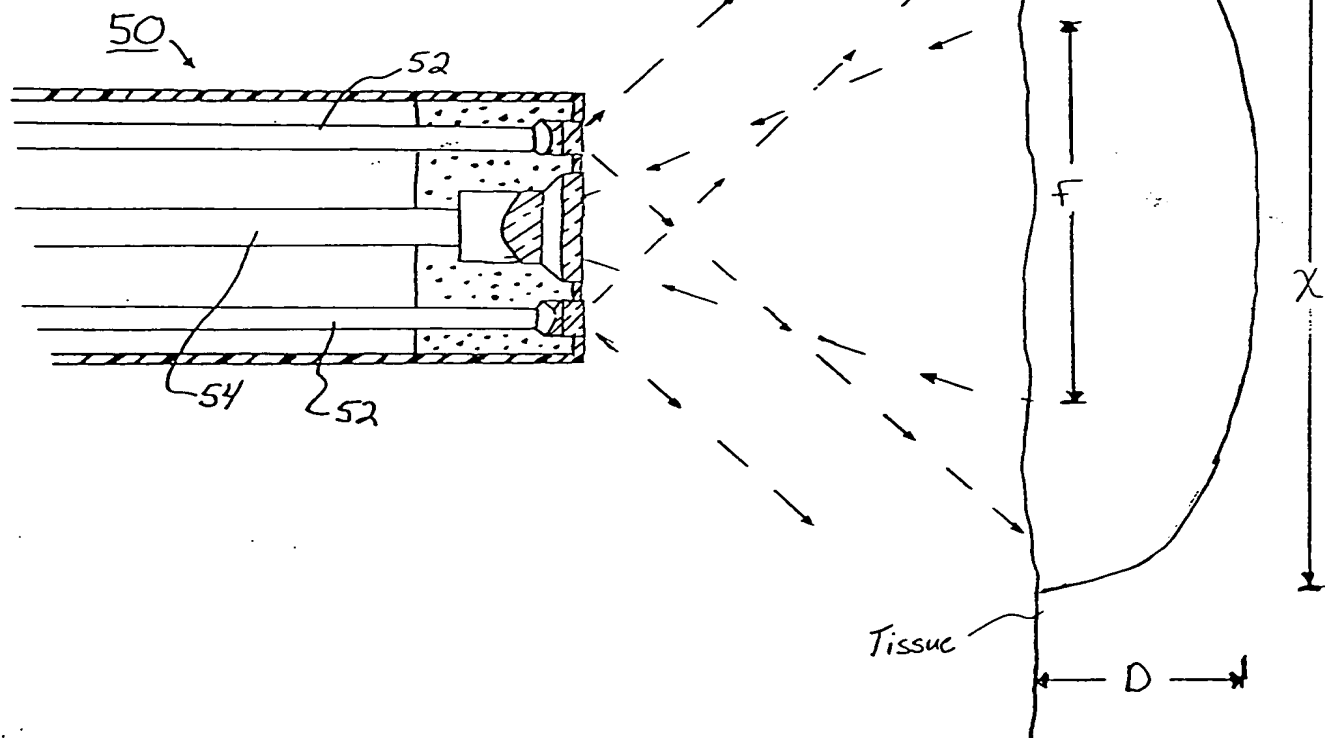


Fig. 5



08/745509-116376

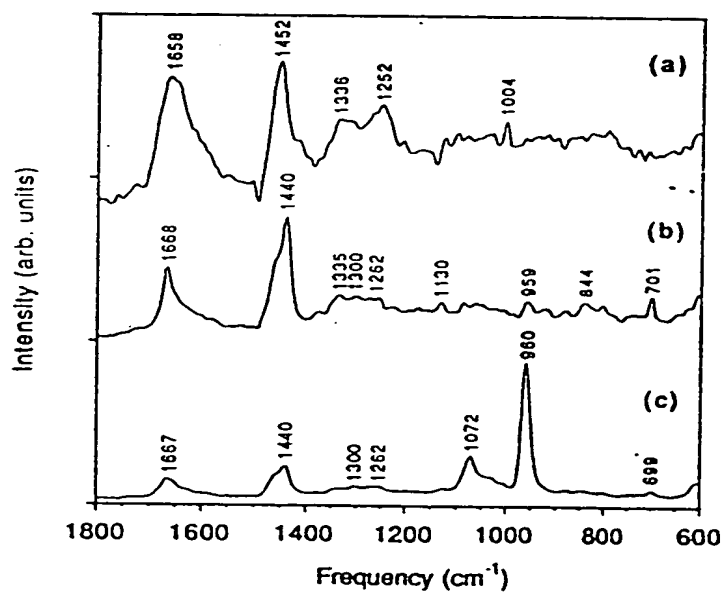


Fig. 6

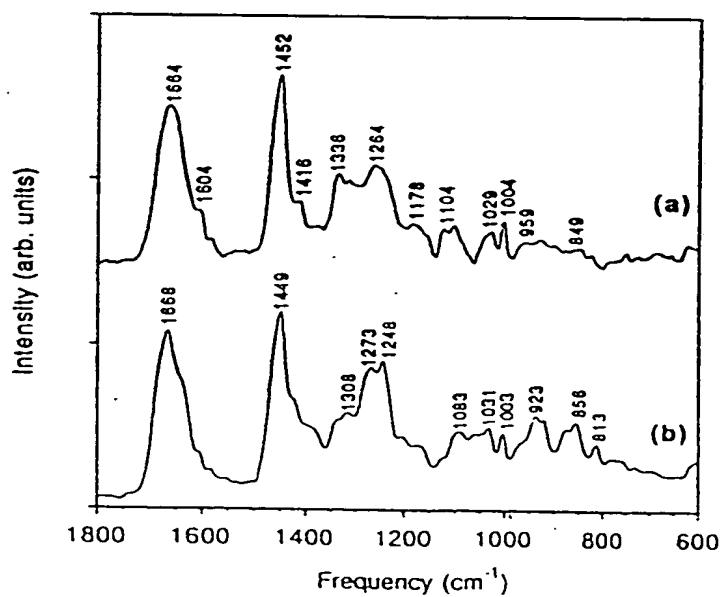


Fig. 7

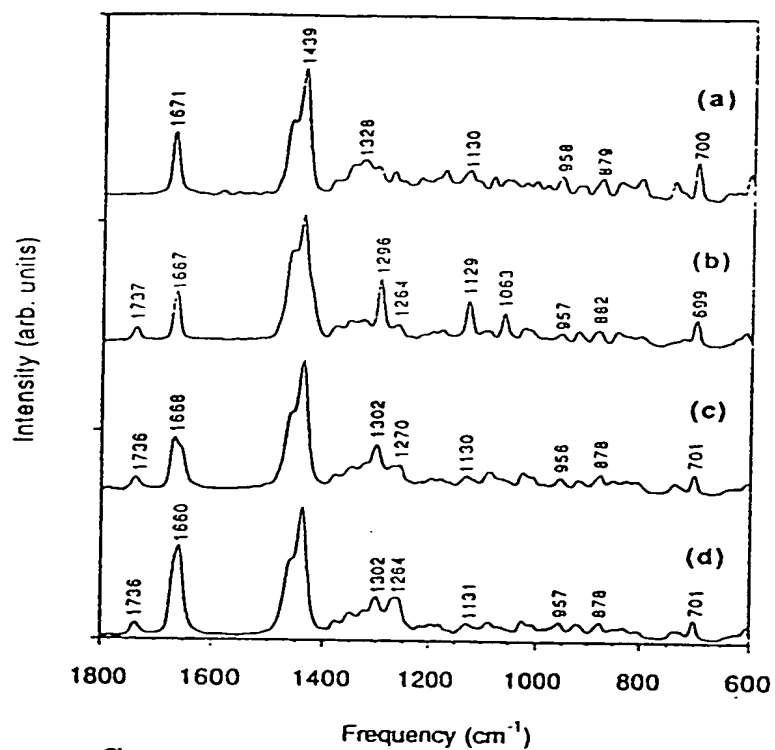


Fig. 9

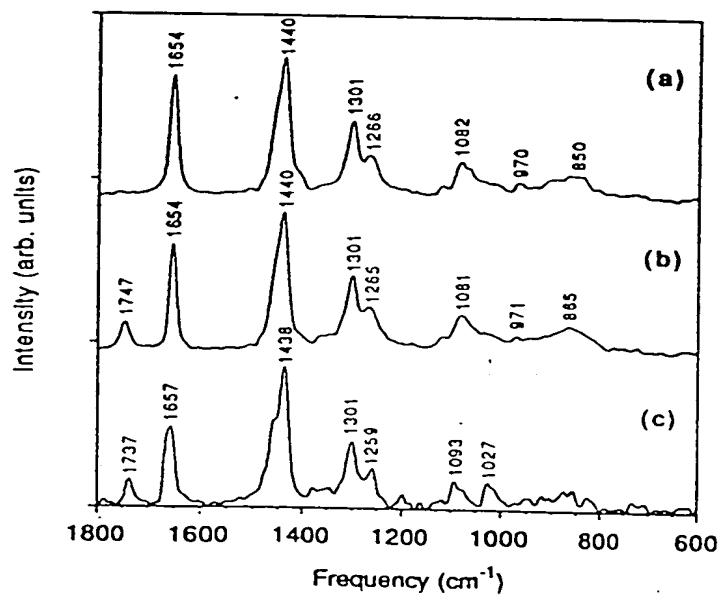


Fig. 10

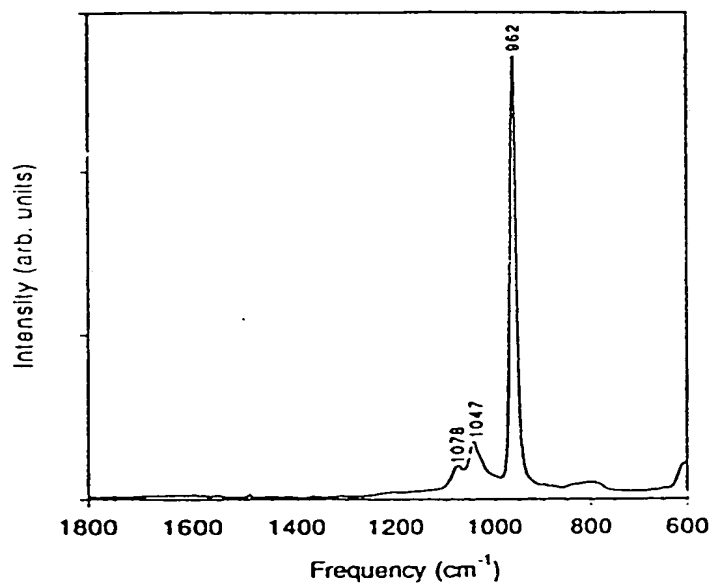


Fig. 11

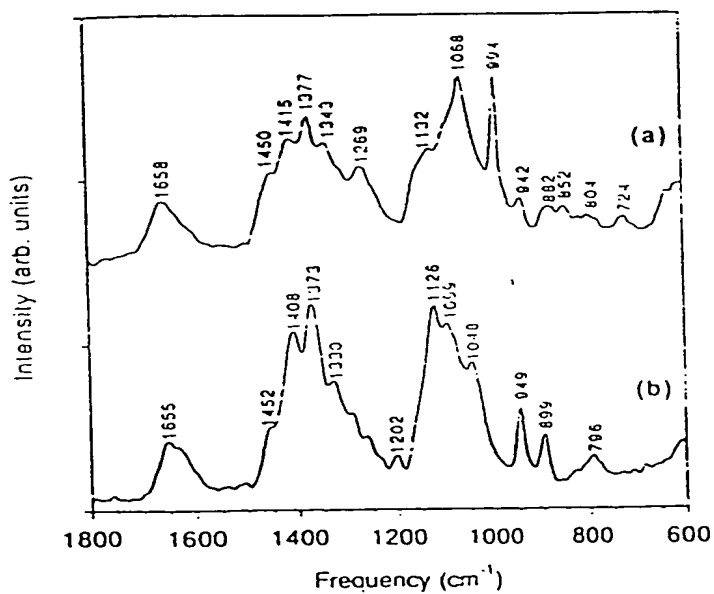


Fig. 8

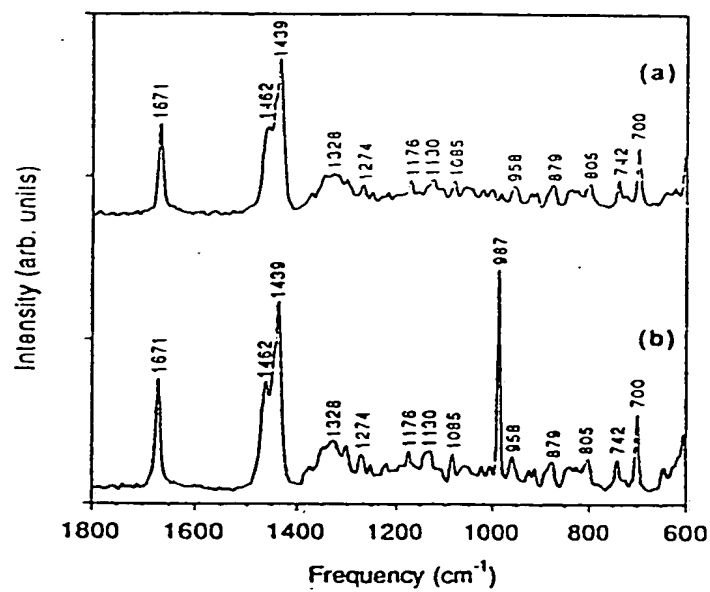


Fig. 12

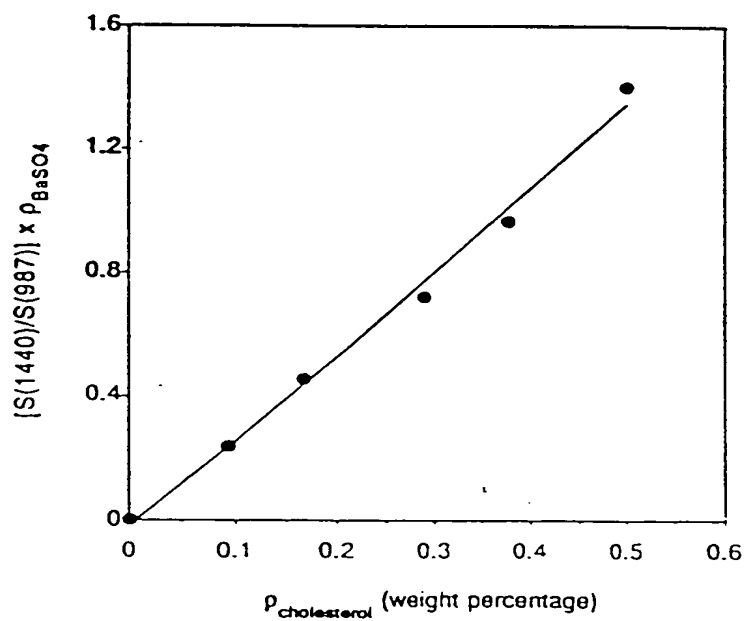


Fig. 13

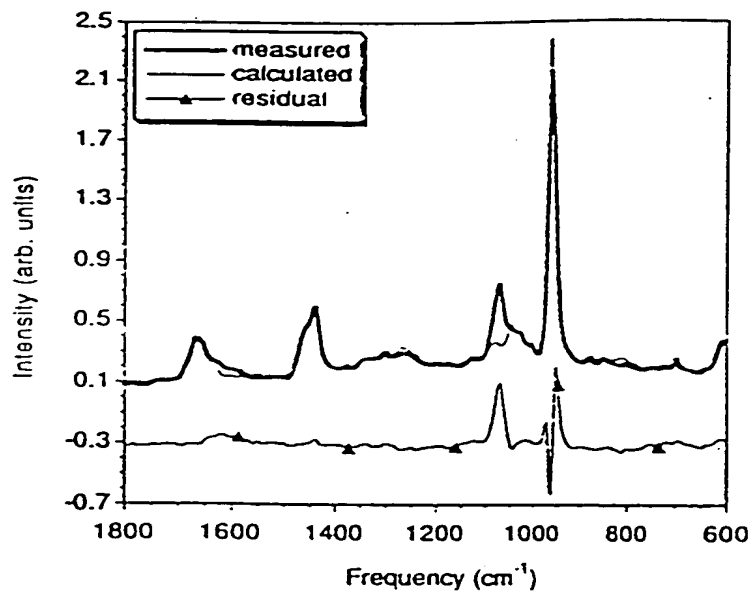


Fig. 21

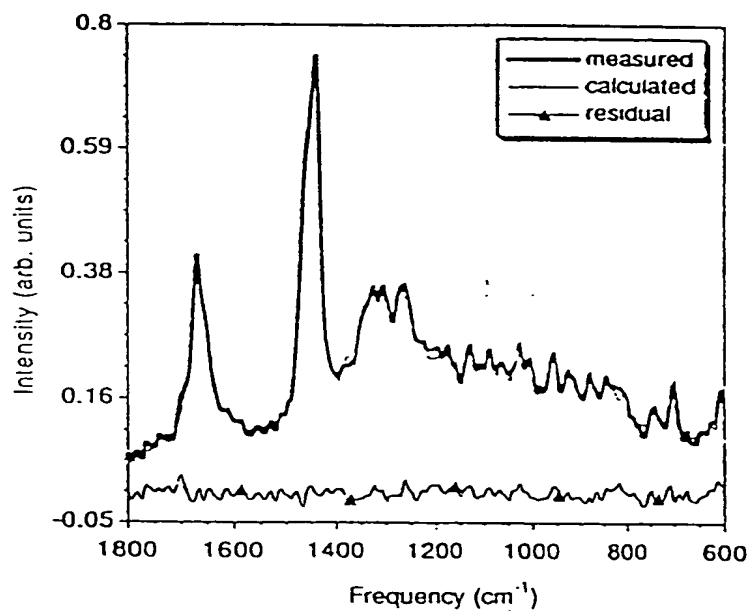
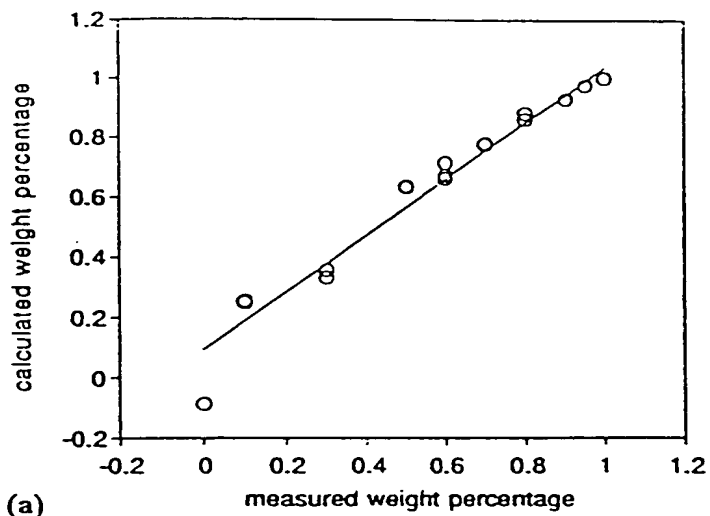
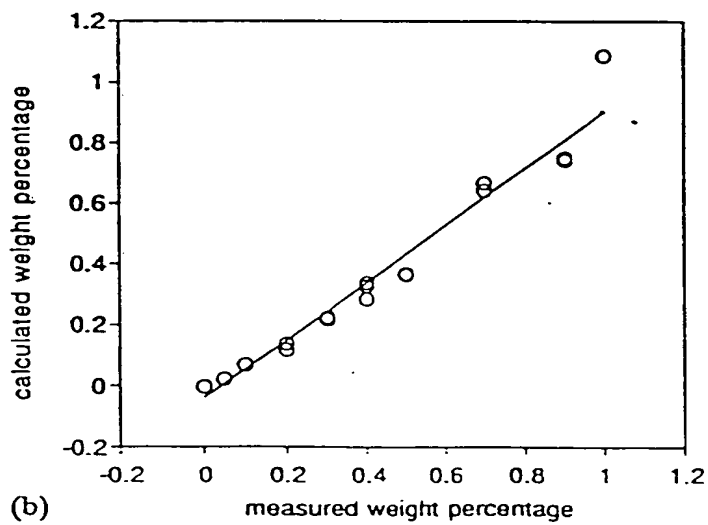


Fig. 14

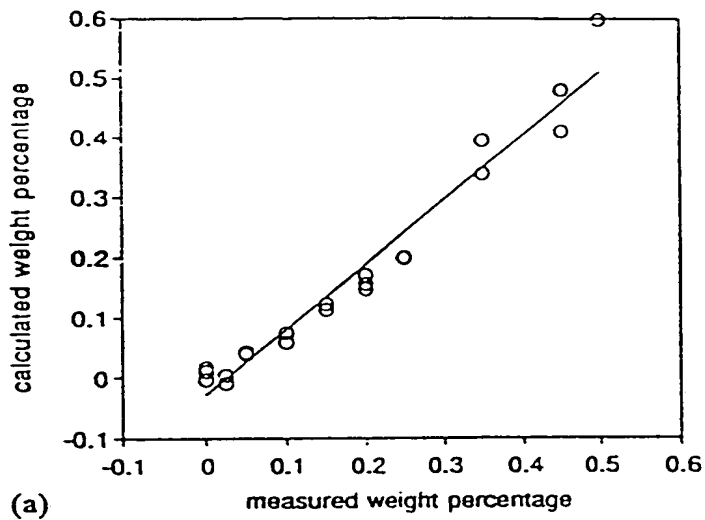


(a)

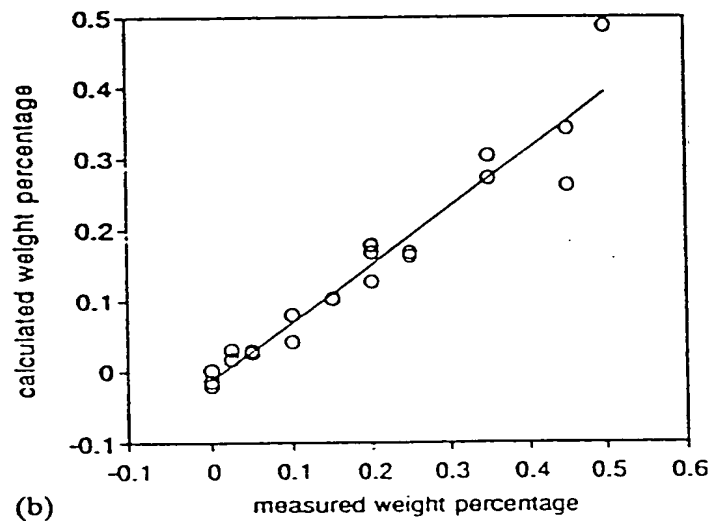


(b)

Fig. 15

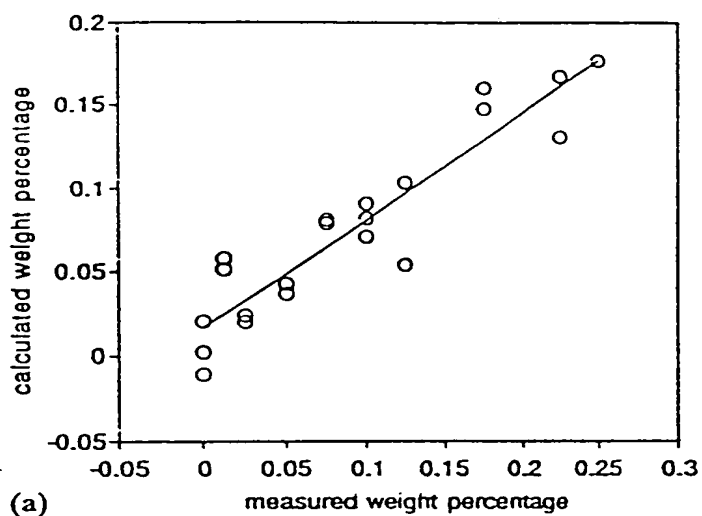


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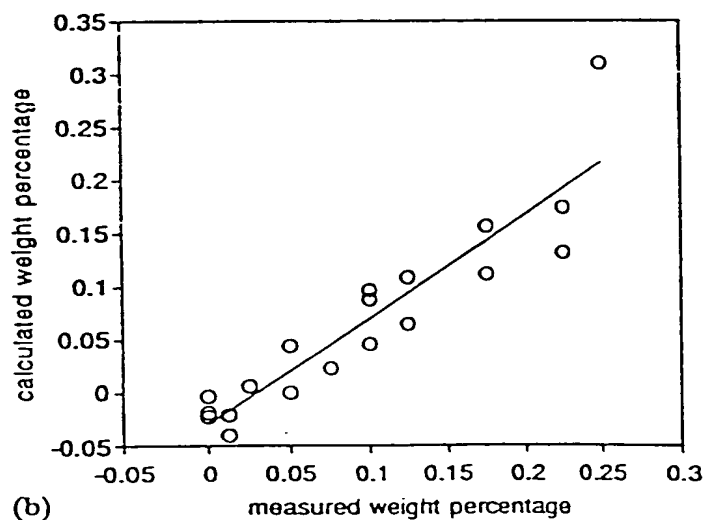


(b)

Fig. 16



(a)



(b)

Fig. 17

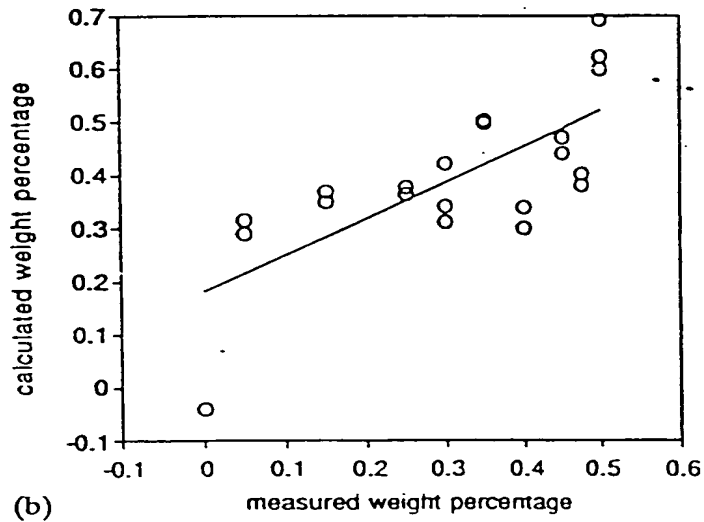
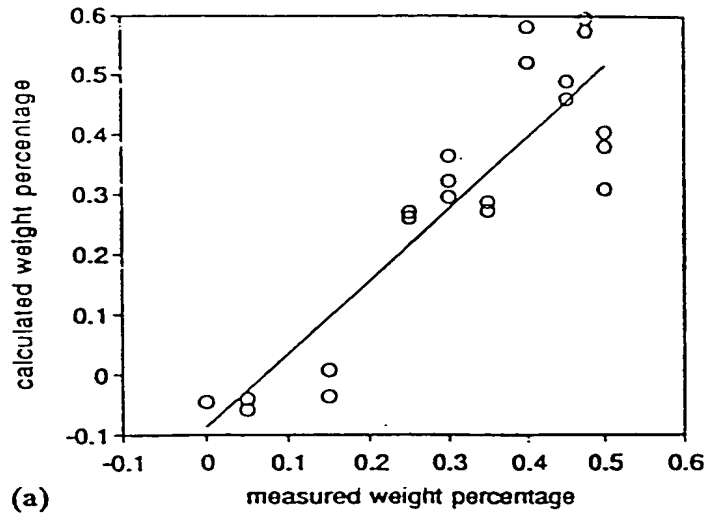


Fig. 18

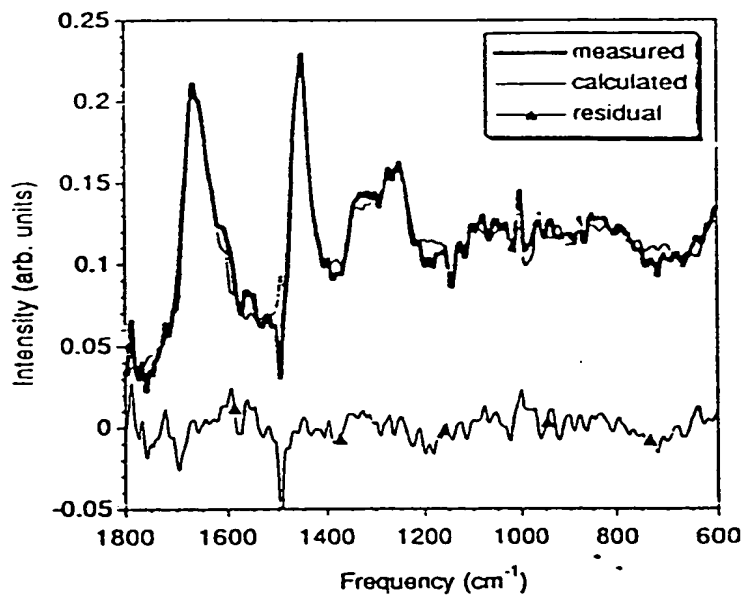


Fig. 19

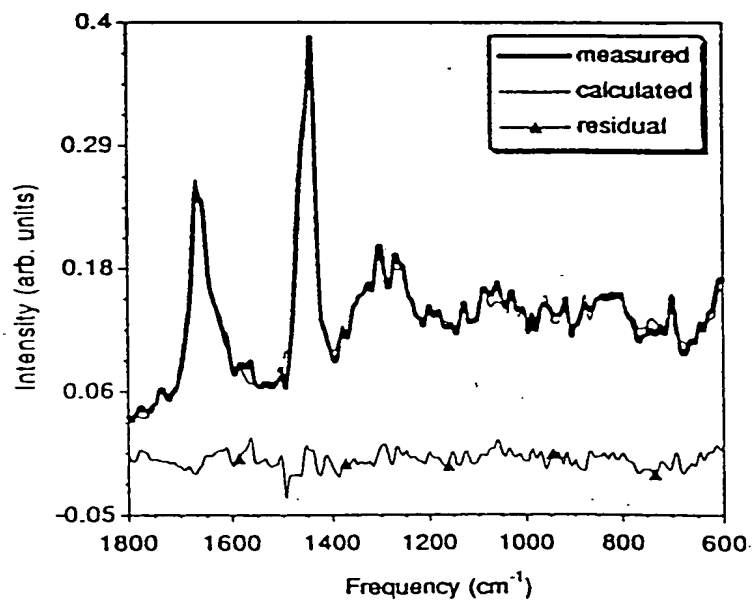


Fig. 20

TABLE 1

Raman scattering weight cross-sections of different bands from proteins and lipids typically found in atherosclerotic aorta relative to that of 1 g BaSO₄

Biological component	Vibrational assignment					
	Ester, C=O		-C=C-		CH ₂ bend	
	Freq. (cm ⁻¹)	Cross-section	Freq. (cm ⁻¹)	Cross-section	Freq. (cm ⁻¹)	Cross-section
Collagen	Amide I	1.00	-	-	1450	0.72
Elastin	Amide I	1.23	-	-	1450	0.79
Chondroitin sulfate A	Amide	0.18	-	-	~1400*	0.58
Hyaluronic acid	Amide	0.58	-	-	~1400*	0.79
Cholesterol	-	-	1671	0.77	1440	3.19
Cholesterol palmitate	1738	0.12	1667	0.36	1440	2.70
Cholesteryl oleate	1738	0.12	1665	1.14	1440	3.70
Cholesteryl linoleate	1740	0.11	1665	1.40	1440	3.02
Palmitic acid	1737	0.52	-	-	1442	4.66
Tripalmitin	1745	0.41	-	-	1440	4.32
					1130	0.35
					1140	0.17
					1146	0.17
					1130	0.76
					1130	0.66

*Calculated for the entire band in the region 1300-1500 cm⁻¹ and probably contains contributions from other modes as well.

TABLE 2

Estimated absolute Raman scattering molecular cross-sections of different bands from lipids typically found in atherosclerotic aorta^a. Units for the absolute cross-section values are $10^{-30} \text{ cm}^2 (\text{molecule} \cdot \text{sr})^{-1}$

Biological component	Vibrational assignment											
	Ester, C=O			-C=C-			CH ₂ bend			C-C stretch		
	Absolute cross-section	Com-parative ^b		Absolute cross-section	Com-parative ^c		Absolute cross-section	Com-parative ^c		Absolute cross-section	Com-parative ^b	Absolute cross-section
Cholesterol	-	-	-	0.67	1	2.85	1	1.37	-	0.34	1	0.34
Cholesteryl palmitate	0.17	1	0.52	0.77	1.37	3.91	1	1.96	0.50	0.19	0.55	0.19
Cholesteryl oleate	0.18	1.06	1.73	2.58	1.96	5.58	0.52	1.59	0.26	0.18	0.53	0.18
Cholesteryl linoleate	0.17	1.00	2.1	3.13	4.53	4.53	0.52	0.97	0.26	0.18	0.53	0.18
Palmitic acid	-	-	-	-	-	2.77	0.9	2.83	0.45	-	-	-
Tripalmitin	0.76	4.49	-	-	-	8.07	2.46	1.23	1.23	-	-	-

^aThe Raman cross-section value for SO_4^{2-} is $0.54 \times 10^{-30} \text{ cm}^2 (\text{molecule} \cdot \text{sr})^{-1}$, corrected for the wavelength dependence [16].

^bMolecular cross-sections compared with given band of cholesteryl palmitate.

^cMolecular cross-sections compared with given band of cholesterol.

TABLE 3
Weight percentages for human aorta calculated from the Raman spectra

Biological component	Normal	Atheromatous	Exposed calcification
Collagen	0.31	0.35	0.68
Elastin	0.61	0.18	-0.006
Total protein	0.93	0.53	0.67
Cholesterol	0.003	0.14	0.088
Cholesteryl oleate	0.064	0.21	0.036
Cholesteryl linoleate	0.002	0.12	0.20
Total lipid ^a	0.068	0.47	0.33
Total cholesteryl ester ^b	0.066	0.32	0.24

^aCholesterol + cholesteryl oleate + cholesteryl linoleate.

^bCholesteryl oleate + cholesteryl linoleate.